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Dawn/Dusk Auroras and Propagating Convection Disturbances: Ionospheric Effects of Increasing Solar Wind Ram Pressure

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A dawn/dusk auroral event that occurred on June 27, 1997 has been studied using observations from the WIND and POLAR spacecraft, Antarctic all-sky images, and Greenland magnetometers. The aurora was caused by a gradual (T ~ 90 min), intense (P_{ram} ~ 11 nPa) solar wind ram pressure (ρV^2) pulse. Auroral intensities on both dawn and dusk flanks of the auroral oval increased linearly with the pressure increase. The aurora occurred in both diffuse and discrete forms. The energy deposition flux into discrete auroras was calculated to be increased by a factor of ~5 when the ram pressure increased by a factor of ~2 during the event. Propagating convection disturbances in the ionosphere were also detected within the auroras. The convection disturbances appeared in the magnetograms as 20 min period and ~100 nT amplitude pulsations, which propagated antisunward at a speed of ~11 km/s. This ionospheric speed mapped to the magnetosheath flow speed very well. Mechanisms of the ionospheric responses are suggested to be some form of viscous interaction that occurs on the magnetopause boundary layer (such as the Kelvin-Helmholtz instability) and adiabatic compression.